Offset strategy AB

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Santos
GLNG Project

Gas Field Development Project
Environmental Impact Statement

Appendix AB Offset strategy

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1 Introduction

This strategy describes Santos Gladstone Liquefied Natural Gas (GLNG's) approach for delivering offsets for the Santos GLNG Gas Field Development Project (the GFD Project). Specifically this strategy provides a framework for the GFD Project to identify future offsets obligations and prepare a proposed offset delivery plan to address significant residual adverse impacts to Matters of State Environmental Significance (MSES) and Matters of National Environmental Significance (MNES).

In recognition of changing policy environment surrounding environmental offsets in Queensland, Santos GLNG proposes to provide offsets in a staged approach aligned to field development activities over the life of the project. Offsets for each stage will be commensurate with any significant residual adverse impacts to the MNES and MSES from each stage of development. This approach to staged offsets is promoted in the *Queensland Offsets Bill 2014* and the *Draft Environmental Offsets Policy* and is also supported by section 5.3 of the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Offsets Policy* (Cth).

The potential impacts arising from the GFD Project activities on terrestrial ecology, environmentally sensitive areas and MNES are described, and mitigation measures are identified. Full details of the terrestrial ecology, environmentally sensitive areas and MNES assessments are provided in Appendix R: Terrestrial ecology and Appendix U1: Report on Matters of national environmental significance (ecology). Full details of the aquatic ecology of the GFD Project area are provided in Appendix S: Aquatic ecology.

1.1.1 Purpose

The purpose of this environmental offsets strategy is to:

- Summarise the Australian and Queensland governments' offset requirements and policies
- Identify the environmental values that exist within the GFD Project area that after avoidance, minimisation, mitigation and remediation measures may require offsetting
- Identify existing areas that may be potentially used as land based offsets for the GFD Project
- Describe Santos GLNG's staged offsets approach
- Demonstrate delivery and acquittal of the offsets requirements within the Terms of Reference.

1.1.2 Project description

Santos GLNG intends to further develop its Queensland gas resources to augment supply of natural gas to its existing and previously approved GLNG Project.

The GFD Project is an extension of the existing approved gas field development and will involve the construction, operation, decommissioning and rehabilitation of production wells and the associated supporting infrastructure needed to provide additional gas over a project life exceeding 30 years.

Specifically, the GFD Project seeks approval to expand the GLNG Project's gas fields tenure from 6,887 km^2 to 10,676 km^2 to develop up to 6,100 production wells beyond the currently authorised 2,650 wells; resulting in a maximum of up to 8,750 production wells. The GFD Project will continue to progressively develop the Arcadia, Fairview, Roma and Scotia gas fields across 35 Santos GLNG petroleum tenures in the Surat and Bowen basins, and associated supporting infrastructure in these tenures and adjacent areas. The location of the GFD Project area and primary infrastructure is shown on Figure 1-1.

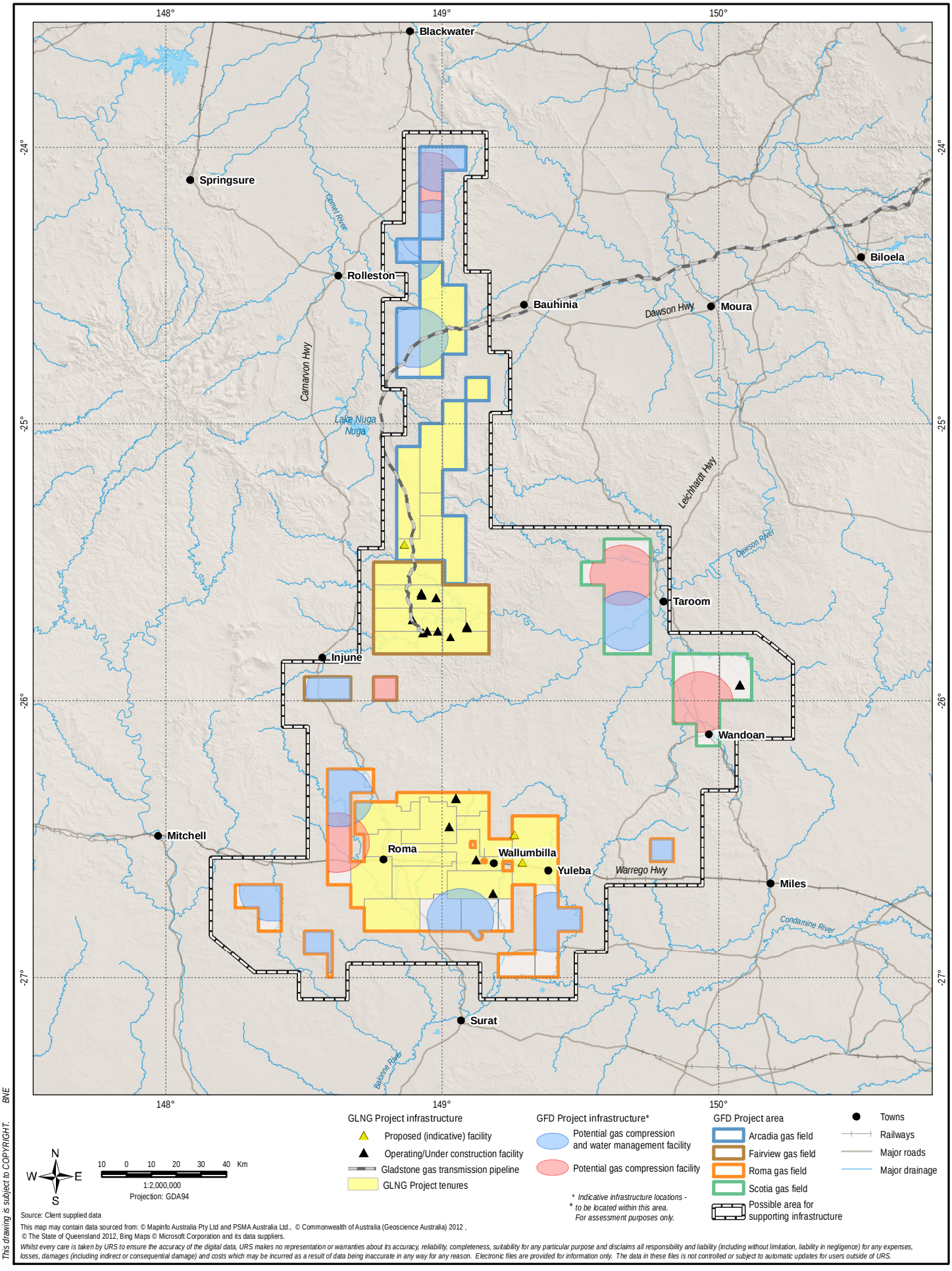
This GFD Project will include the following components:

- Production wells
- Fluid injection wells, monitoring bores and potentially underground gas storage wells
- Gas and water gathering lines
- Gas and water transmission pipelines
- Gas compression and treatment facilities
- Water storage and management facilities
- Access roads and tracks
- Accommodation facilities and associated services (e.g. sewage treatment)
- Maintenance facilities, workshops, construction support, warehousing and administration buildings
- Utilities such as water and power generation and supply (overhead and/or underground)
- Laydown, stockpile and storage areas
- Borrow pits and quarries
- Communications.

The final number, size and location of the components will be determined progressively over the GFD Project life and will be influenced by the location, size and quality of the gas resources identified through ongoing field development planning processes, which include consideration of land access agreements negotiated with landholders, and environmental and cultural heritage values.

Where practicable, the GFD Project will utilise existing or already approved infrastructure (e.g. accommodation camps, gas compression and water management facilities) from the GLNG Project or other separately approved developments. The GFD Project may also involve sourcing gas from third-party suppliers, as well as the sharing or co-location of gas field and associated facilities with third parties.

Approved exploration and appraisal activities are currently underway across the GFD Project's petroleum tenures to improve understanding of the available gas resources. As the understanding of gas resources increases, investment decisions will be made about the scale, location and timing of the next stages of field development.



Source: Client supplied data

Santos GLNG Project

GFD PROJECT EIS

OFFSET STRATEGY

URS

OFFSET STRATEGY

Figure: **1-1**

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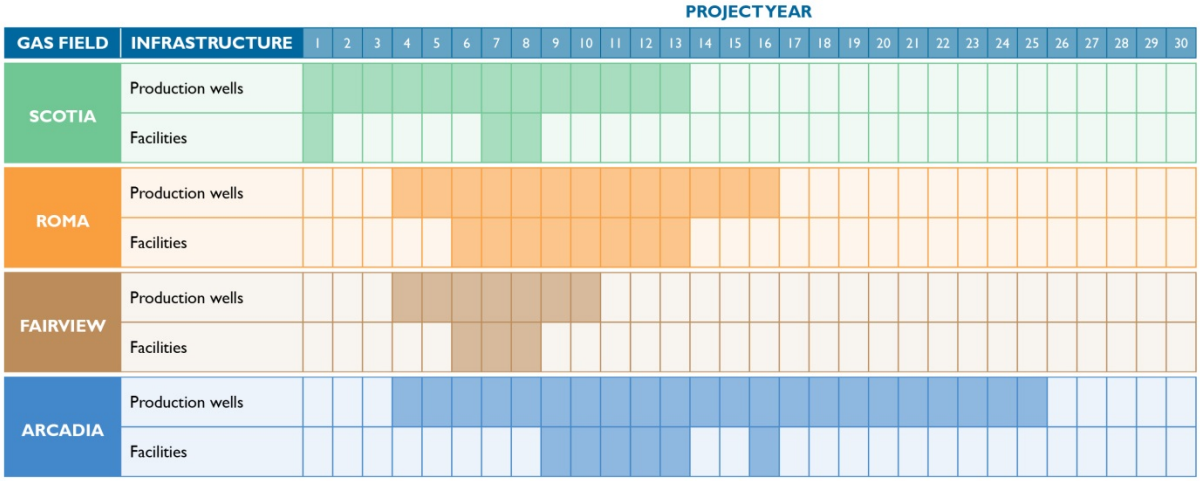
For the purposes of this EIS, a scenario based on the maximum development case was developed at the approval of the ToR. This scenario assumed that production from the wells and upgrading of the gas compression facilities in the Scotia gas field would commence in 2016, followed by the GFD Project wells in the Roma, Arcadia and Fairview gas fields in mid-2019. This schedule is indicative only and was used for the purpose of the impact assessment in this EIS.

The potential GFD Project schedule is outlined in Figure 1-2. This schedule provides an overall field development scenario for the purposes of assessment in this EIS.

Figure 1-2 Proposed GFD Project development schedule



Decommissioning and rehabilitation will occur progressively throughout the life of the GFD Project as construction activities cease and exhausted gas wells are decommissioned. Final decommissioning and rehabilitation will occur at the end of gas production in accordance with relevant approvals and regulatory requirements.

2 Environmental offsets policy setting for the GFD Project

Offsets are measures that compensate for the significant residual adverse impacts of an action on the environment. During the impact assessment process offsets provide environmental benefits to counterbalance the impacts that remain after avoidance, minimisation, mitigation and remediation and rehabilitation measures. The remaining, unavoidable impacts are termed 'residual impacts' and it is significant residual adverse impacts that require offsetting.

Currently the Queensland Department of Environment and Heritage Protection (EHP) is developing a single environmental offsets framework for Queensland, due to start in 2014. The framework will replace five existing Queensland Government offset policies, while retaining a focus on environmental protection. It will provide clarity for Queenslanders as a 'one stop' for environmental offsets, clearly establishing what an offset is and how an offset may be delivered. At the time of writing this EIS the new framework consisted of:

- *Queensland Offsets Bill 2014* – available for review
- *Proposed Environmental Offsets Regulation 2014* – not released
- *Draft Environmental Offsets Policy* – available for review.

In recognition of changing policy environment this offsets strategy considers both the existing policies as well as the policies currently under review by the Queensland Government. Santos GLNG is committed to delivering environmental offsets in consultation with the Australian and Queensland Governments.

2.1 Santos GLNG Gas Field Development Project – Terms of Reference

On 15 November 2012, the Coordinator-General declared the project to be a 'significant project' under section 26(1) (a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). As the GFD Project has the potential to cause environmental, social or economic impacts, the Santos GLNG must prepare an environmental impact statement (EIS). The Terms of Reference sets out the general and specific matters to be addressed in the EIS for the GFD Project. Specific to offsets, these include:

- *Environmental offsets may be proposed to counterbalance any remaining loss of environmental values, consistent with the relevant Queensland Government and/or Commonwealth offset policies.*
- *For any residual significant impacts, the proponent must propose offsets (including an offsets strategy) to compensate for these impacts that are in accordance with the EBPC Act 1999 Environment Offsets Policy and associated Offsets Assessment Guide*
- *The proponent must assess the potential availability of adequate offset areas for those values subject to a requirement for offset and for which land-based offsets are proposed.*

2.2 Australian government framework and policies

2.2.1 EPBC Act Environmental Offsets Policy

The *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC) Act Environmental Offsets Policy* outlines the Australian Government's approach to the use of environmental offsets under the EPBC Act. The EPBC Act protects national environmental assets, known as MNES, as well as other protected matters. The *EPBC Act Environmental Offsets Policy* relates to all matters protected under the EPBC Act. Any significant residual adverse impact to a protected matter that remains following all actions to avoid and mitigate this impact will attract an offsets obligation under this policy.

On 3 December 2012 the Commonwealth Environment Minister determined the GFD Project to be a 'controlled action' under the EPBC Act, due to the likely potential impacts on MNES (reference number: EPBC 2012/6615). The controlling provisions under the EPBC Act are:

- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A).

The GFD Project will impact upon threatened ecological communities (TECs) and habitat for threatened and migratory species listed under the EPBC Act. Offsets will be required under this policy if the residual adverse impact on these protected matters is considered to be significant. Details regarding potential TECs and habitat for threatened and migratory species listed under the EPBC Act are provided in Section 3 (Table 1).

The offsets package required under this policy is a suite of actions that a proponent undertakes in order to compensate for residual adverse impacts that have been determined as significant for a project. The offsets can be direct offsets which provide a measurable conservation gain for an impacted protected matter or indirect offsets such as other compensatory measures. Under this policy the offsets must contribute to the ongoing viability of the protected matter impacted by the proposed action, and deliver an overall conservation outcome that improves or maintains the viability of the protected matter.

2.3 Queensland government framework and policies

2.3.1 Queensland Government Environmental Offsets Policy

The *Queensland Government Environmental Offsets Policy 2008* (QGEOP) guides the appropriate use of environmental offsets across terrestrial and aquatic ecosystems of Queensland, based on the principles of Ecologically Sustainable Development (ESD). The purpose of the QGEOP is to provide:

- *The supporting framework for environmental offsets in Queensland*
- *Principles and guidelines for using environmental offsets that guide the preparation, operation, monitoring and review of existing specific issue offsets policies and the development of new specific-issue offsets policies*
- *Guidance on when offsets should and should not be considered.*

QGEOP provides the framework for the specific issue offset policies that apply in Queensland. These specific issue policies are discussed in detail below.

2.3.2 Queensland Biodiversity Offset Policy

The *Queensland Biodiversity Offset Policy 2014* provides a mechanism to offset residual impacts from a development on State significant biodiversity values (SSBVs) that cannot be avoided. The policy provides the framework to ensure that there is no net loss of biodiversity and where SSBV need to be offset, the policy requirements are applied consistently across the relevant development types.

There are number of State significant biodiversity values that require offsetting under this policy. The SSBVs present can be grouped into the following:

- Regional ecosystems
- Essential habitat
- Wetlands
- Watercourses
- Connectivity
- Protected animals
- Legally secured offset area under State legislation
- Protected plants
- Wetlands of high ecological significance in Great Barrier Reef Catchments.

A number of SSBVs occur within the GFD Project area.

Section 5 deals with the application of the *Queensland Biodiversity Offset Policy* on development projects and states:

> *This policy does not apply to development that is a significant project declared under section 26(1)(a) of the State Development and Public Works Organisation Act 1971 (SDPWO Act).*

This policy does not strictly apply to the GFD Project. However, under section 35 of SDPWO Act the Coordinator-General must prepare a report evaluating the EIS. In the evaluation report the Coordinator-General has discretionary power to state conditions required for the project and may prescribe compliance with all or part the policy as part of an approval for a significant project.

2.3.3 Policy for Vegetation Management Offsets

Under section 22A(2) of the *Vegetation Management Act 1999* (VM Act) (Qld), a vegetation clearing application is for a relevant purpose if the applicant satisfies the Chief Executive that the development applied for is a project declared to be a coordinated (significant) project under section 26(1)(a) of SDPWO Act. The regional vegetation management codes set out the performance requirements that a development application for a 'significant project' are required to meet before clearing native vegetation. A land based offset provided under the *Policy for Vegetation Management Offsets* may be proposed by an applicant a solution to meet the specific performance requirements to maintain the current extent of particular regional ecosystems.

Where the *Sustainable Planning Act 2009* (SP Act) (Qld) defines a development as 'assessable development,' the clearing of vegetation associated with that development is regulated by the VM Act. The VM Act does not apply petroleum activities. These as these are defined as 'resource activities' and are 'not assessable development' under the *Sustainable Planning Regulation 2009* (Qld).

This policy does not strictly apply to the GFD Project. However, under section 35 of SDPWO Act the Coordinator-General must prepare a report evaluating the EIS. In the evaluation report the Coordinator-General has discretionary power to state conditions required for the project and may prescribe compliance with all or part the policy as part of an approval for a significant project.

2.3.4 Marine fish habitat offset policy

This policy sets the requirements of the Department of Agriculture, Fisheries and Forestry (DAFF), offset conditions to counterbalance permanent or temporary impacts or loss on fisheries resources or fish habitat relevant to fisheries development approval (FDA) decisions under the *Fisheries Act 1994* (the Fisheries Act). It applies where a fisheries development approval is required for marine fish habitats, specifically, marine plants and other tidal fish habitats and / or declared Fish Habitat Areas.

There are no marine plants and no Fish Habitat Areas located within the GFD Project area. Therefore there will be no significant residual impacts that require offsetting.

2.3.5 Offsets for Net Gain of Koala Habitat in Southeast Queensland Policy

This policy only applies to the South East Queensland Bioregion. The whole of the GFD Project area is located within the Brigalow Belt Bioregion. There will be no residual significant impact to koala habitat in the South East Queensland Bioregion as a result of the GFD Project.

2.3.6 Draft Queensland Environmental Offsets Policy

The Department of Environment and Heritage Protection (EHP) is developing a whole of government offsets policy and is currently in consultation with industry stakeholders. The intent of the draft policy is to outline a Queensland Government's approach to the use of environmental offsets across Queensland's terrestrial and aquatic ecosystems. The *draft Queensland Environmental Offsets Policy* provides a single framework for environment-related offsets in Queensland and replaces the specific issue policies discussed above.

Amongst other things the *Draft Queensland Environmental Offsets Policy* contains provisions for a Staged Offsets Delivery where the disturbance activity and the delivery of the offsets will be staged (Section 2.4.1) and Transitional Provisions for projects that have commenced under the previous framework (Appendix One). It is expected that the draft policy will be implemented during the middle of 2014.

Given this developing nature of this policy area, Santos GLNG intends to work with the Queensland Government in developing a suitable offset for the GFD Project. The offset package will be developed in consultation with the Queensland Government and in consideration of the all of the above mentioned policies.

2.3.7 Environmental Offsets Act

The Explanatory Notes for the Bill state that the Bill

> *will introduce primary legislation to coordinate Queensland's environmental offsets framework, giving effect to a whole-of-government approach and replacing the complexities and duplication surrounding the five existing policies. The Bill also provides a single point-of-truth under primary legislation resulting in a more timely and affordable delivery of environmental offsets under an integrated regulatory framework.*

The Act includes consequential amendments to existing legislation to align the environmental offset provisions in each Act. This includes VM Act, the *Nature Conservation Act 1992* (Qld) (NC Act), the *Environmental Protection Act 1994* (Qld) (EP Act), the Fisheries Act, and SP Act. This Bill will provide for the introduction of a single policy, replacing the five current offset policies listed above.

The Act establishes a single environmental offsets policy. This ensures that previous State government environmental offset policies in effect prior to the introduction of the Act will no longer apply to applications lodged after the commencement of the Act. At the time of writing, the substantive provisions of the Act were not in operation.

2.3.8 Proposed Environmental Offsets Regulation 2014

Under the proposed *Environmental Offsets Regulation 2014* an environmental offset may be required to counterbalance significant residual impacts on a 'prescribed environmental matter' arising from a 'prescribed activity'. The proposed Regulation defines 'prescribed activity' and 'prescribed environmental matters'. Although the proposed Regulation has not been released prior to the development of this chapter, a list of the 'prescribed activity' and 'prescribed environmental matters' are listed on EHP's website.

The proposed Regulation will not change the prescribed activities for which an environmental offset may presently be required. Offsets may be required for activities regulated under the SP Act, EP Act, NC Act or *Marine Parks Act 2004* (MP Act).

Under the *Environmental Offsets Bill*, a prescribed environmental matter is any of the following matters prescribed under the proposed Regulation:

- Matters of national environmental significance (MNES) – these will not be listed under the Regulation unless the Queensland offset framework is accredited by the Commonwealth
- Matters of State environmental significance (MSES) – these are values that are protected under State legislation (see Section 3.3).
- Matters of local environmental significance – these are values protected under local government planning instruments. This includes, for example, koala bushland habitat in South East Queensland as defined under the State Planning Policy.

The proposed *Environmental Offsets Regulation 2014* is still under development at the time of writing this EIS. The information regarding the Regulation provided for in this strategy has been produced using information on EHP's website and through personal communication with EHP staff. While Santos GLNG believes the information provided in this strategy is accurate and current, the precise information in the regulation will not be known until the document is finalised.

3 Environmental values that may require offsetting

Environmental values that require offsetting are defined in the relevant Australian and Queensland government offsets policies. These values have been broadly grouped into MNES for matters regulated by the Australian Government and MSES for matters regulated by the Queensland Government.

There may be MNES that directly correspond to a MSES. It is important to note that the where a MNES is also a MSES only one offset will be provided for that matter.

MSES are values defined on EHP Website and will feature in the *Proposed Environmental Offsets Regulation 2014*. MNES are defined in the EPBC Act *Significant Impact Guidelines 1.1: Matters of National Environmental Significance.*

3.1 When offsets will be required

Offsets provide environmental benefits to counterbalance any significant residual impacts to MNES or MSES that remain after avoidance, minimisation, mitigation and remediation and rehabilitation measures. The remaining, unavoidable impacts are termed 'residual impacts'. It is where these residual impacts are considered significant that offsets will be required.

The potential impacts to MNES resulting from the GFD Project activities can vary based on the type of petroleum activities undertaken and the attributes of the MNES or MSES impacted. It is likely for some GFD Project activities to have a cumulative, irreversible and/or permanent impact upon specific MNES values, even after the implementation of all mitigation measures. In these cases, if the residual impacts are significant some level of offset will be required. Consequently, offsets will be employed to account for the significant residual impacts potentially resulting from the GFD Project.

It is important to note that the potential environmental impact results from the Constraints Planning Assessment Model and the Land Disturbance Probabilistic Calculation Model provided in Table 3-1 and Appendix A is the unmitigated potential disturbance. The model does not consider the avoidance, minimisation, mitigation and remediation and rehabilitation measures employed by Santos GLNG nor does it evaluate whether the disturbance results in significant residual adverse impact. While the model itself does not estimate the precise areas of significant residual adverse impact to MNES, those impacts can be assumed to be a smaller subset of the modelled disturbance to MNES. Impacts to MNES and MSES will be assessed and quantified in stages prior to finalising the design of the gas field infrastructure.

3.2 Matters of National Environmental Significance

The EPBC Act environmental offsets policy relates to all protected matters under the EPBC Act. The protected matters relevant to the GFD Project are restricted to MNES defined by the EPBC Act which are:

- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Ramsar wetlands of international importance
- The Commonwealth marine environment
- World Heritage properties

- National Heritage places
- Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

On 3 December 2012 the GFD Project was determined to be a 'controlled action' by the Commonwealth Environment Minister requiring assessment and approval under the EPBC Act, due to the likely potential impacts on MNES. The relevant controlling provisions nominated under the EPBC Act are for the following MNES:

- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A).

In addition, water resources in relation to coal seam gas developments are an MNES and will be specifically dealt with in the MNES Water Resources Report for the GFD Project. As offsets for this MNES are not currently considered in the EPBC act offsets policy, offsetting of significant residual impacts to water resources are not considered in this Strategy.

Specific high level assumptions based on predictive gas resources as well as major topographical features were applied to the Constraints Planning Assessment Model to identify the potential disturbance areas resulting from the GFD Project. Based on the outputs Constraints Planning Assessment Model (refer Appendix A) and applying the no-go constraint areas, the potential impacts to MNES within the GFD Project tenures were identified.

A full list of the model output and the relevant MNES is provided in Appendix A. The MNES and their likely presence within the GFD Project tenures (or Terrestrial Ecology Study area (defined as the GFD Project tenures plus a 25 km buffer)) and these potential impacts are presented in summary in Table 3-1 below.

Table 3-1 MNES and their likely presence within the GFD Project tenures or Terrestrial Ecology Study area

MNES value	Trigger	Likely presence within the GFD Project tenures or Terrestrial Ecology Study area
Threatened Ecological Communities	Threatened ecological communities that are listed on the Species Profile and Threats Database (SPRAT) as: • Critically endangered • Endangered • Vulnerable.	The Constraints Planning Assessment Model identified for the GFD Project tenures development scenario an unmitigated potential disturbance area for 6,100 wells over an area of 1,067,200 ha as follows: • 179 ha of Brigalow (Acacia harpophylla dominant and co-dominant) • 124 ha of Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • 190 ha of Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions • 284 ha of Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin • 517 ha of Weeping Myall Woodlands. The TECs listed above are present within the GFD Project tenures. In addition to the above mentioned TECs, there are 3 spring complexes located within the Fairview gas fields that are classified as the TEC 'community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'. These spring complexes include Yebna 2/311 (18 spring vent), Lucky Last (12 spring vents) and Spring Rock Creek (1 spring vent). The location of these springs is known and these springs are monitored and managed under the EPBC Springs Joint Industry Plan (JIP).
Threatened flora species	Critically endangered, endangered and vulnerable flora species listed under the EPBC Act 1999.	A total of 24 flora species listed under the provisions of the EPBC Act are predicted or are known to occur within the Terrestrial Ecology Study area. Of these, 16 are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report (Australian Government 2013). Twenty species listed under the provisions of the EPBC Act are known to occur based on specimen-backed records in the Wildlife Online, HERBRECS and Atlas of Living Australia databases. Four species are considered to have a moderate likelihood of occurrence within the tenures of the GFD Project tenures, based on being predicted to occur and the presence of some suitable habitat (refer Appendix B). For the GFD Project development scenario of for 6,100 wells over an area of 1,067,200 ha, the Constraints Planning Assessment Model identified an unmitigated potential disturbance for each species ranging between 4 ha and 2,496ha (refer Appendix A).

MNES value	Trigger	Likely presence within the GFD Project tenures or Terrestrial Ecology Study area
Threatened fauna species	Critically endangered, endangered and vulnerable fauna species listed under the EPBC Act 1999.	Based on database searches, 26 fauna species listed under the provisions of the EPBC Act are known or are predicted to occur in the Terrestrial Ecology Study area. This includes 11 birds, one fish, one gastropod, six reptiles and seven mammals. Of these, 23 fauna species listed under the provisions of the EPBC Act are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report (Australian Government 2013). Thirteen species listed under the provisions of the EPBC Act are known to occur based on specimen-backed records in the Wildlife Online, Queensland Museum, Birds Australia and Atlas of Living Australia databases. For the GFD Project development scenario of for 6,100 wells over an area of 1,067,200 ha, the Constraints Planning Assessment Model identified a cumulative unmitigated potential disturbance of: • 7,072 ha of habitat for endangered fauna species • 7,415 ha of habitat for vulnerable fauna species.
Migratory species	The list of migratory species established under section 209 of the EPBC Act comprises native migratory species which are identified in: • The Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II); • The Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA); and • an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).	Based on database searches, 23 fauna species listed as 'Migratory' under the provisions of the EPBC Act are predicted to occur in the Terrestrial Ecology Study area. Of these, 13 'Migratory' species are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report. Nineteen species listed under the provisions of the EPBC Act are known to occur based on specimen-backed records in the Wildlife Online, Queensland Museum, Birds Australia and Atlas of Living Australia databases For the GFD Project development scenario of for 6,100 wells over an area of 1,067,200 ha, the Constraints Planning Assessment Model identified an unmitigated potential disturbance of 17,229 ha of habitat for migratory fauna species.
Ramsar wetlands	The EPBC Act enhances the management and protection of Australia's Ramsar wetlands. A 'declared Ramsar wetland' is an area that has been designated under Article 2 of the Ramsar Convention or declared by the Minister to be a declared Ramsar wetland under the EPBC Act.	The GFD Project tenures are located within the Fitzroy (north) and Condamine-Balonne (south) catchments. The nearest Ramsar wetland of international significance to the GFD Project area is the Narran Lake Nature Reserve. This wetland is located 75 km north-west of Walgett in New South Wales, approximately 320 km downstream of the GFD Project boundary in the Condamine-Balonne catchment.
The Commonwealth marine environment	Is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters.	No commonwealth marine environments are located within or adjacent the GFD Project area. Given the large separation distance, localised and manageable nature of project impacts it is unlikely that the GFD Project would result in either a direct or indirect impact to commonwealth marine environments.

MNES value	Trigger	Likely presence within the GFD Project tenures or Terrestrial Ecology Study area
World Heritage properties	A declared World Heritage property is an area that has been included in the World Heritage List or declared by the Minister to be a World Heritage property.	No world heritage properties are located within or adjacent the GFD Project area. The nearest world heritage area is the Great Barrier Reef located approximately 190 km downstream from the GFD Project area. Given the large separation distance, localised and manageable nature of project impacts it is unlikely that the GFD Project would result in either a direct or indirect impact to world heritage properties.
National Heritage places	Under the EPBC Act the National Heritage List includes natural, historic and Indigenous places of outstanding heritage value to the nation.	Taroom Aboriginal Reserve is a national heritage property that occurs on the Dawson River near Bundulla Road, approximately 10 km east of Taroom in proximity to tenure ATP 803. Given the large separation distance between the Project area and the Taroom Aboriginal Reserve it is considered unlikely the GFD Project will impact upon the Taroom Aboriginal Reserve.
Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park, stretched along the coast of Queensland, is about 344,400 square kilometres. Since 25 November 2009, the Great Barrier Reef Marine Park is recognised as a MNES, which means it is protected under the EPBC Act	Although the northern half of the GFD Project area is located within the catchment of the Great Barrier Reef Marine Park, the Marine Park boundary is located approximately 190 km downstream from the GFD Project area. Given the large separation distance, localised and manageable nature of project impacts it is unlikely that the GFD Project would result in either a direct or indirect impact to the Great Barrier Reef Marine Park.
Nuclear actions	The EPBC Act recognises the protection of the environment from nuclear actions as a matter of national environmental significance.	The GFD Project does not involve any nuclear actions.
A water resource, in relation to coal seam gas development and large coal mining development	Water resources are a matter of national environmental significance in relation to coal seam gas and large coal mining development. Actions involving exploration, appraisal and pilot developments may be captured by the definition where they involve extraction of gas or coal.	The GFD Project will expand the GLNG Project's gas fields from 6,887 km^2 to 10,676 km^2 and develop an additional 6,100 production wells beyond the currently authorised 2,650 wells; resulting in a maximum of 8,750 production wells. This MNES is specifically dealt with separately in the MNES Water Resources Report. As offsets for this MNES are not currently considered in the EPBC Act offsets policy, this MNES is not considered further in this Strategy.

3.3 Matters of State Environmental Significance

The proposed Environmental Offsets Regulation has not been released; however, a full list of the MSES has been published on EHP's website. The following MSES will be listed as 'prescribed environmental matters' under the proposed Environmental Offsets Regulation:

- The following protected areas declared under the NC Act:
  - National park
  - National park (scientific)
  - National park (Aboriginal land)
  - National park (Torres Strait Islander land)
  - National park (Cape York Peninsular Aboriginal land)
  - National park (recovery)
  - Conservation parks
  - Resources reserve
  - Nature refuges.
- The following zones of Queensland marine parks (Great Barrier Reef Coast Marine Park, Moreton Bay Marine Park and Great Sandy Marine Park) declared under the MP Act 2004:
  - Marine national park
  - Buffer
  - Marine conservation park
  - Scientific research
  - Preservation.
- The following areas and values declared or otherwise described under the *Fisheries Act* 1994:
  - Declared fish habitat areas
  - Marine plants
  - Fish passage.
- The habitat for the following protected wildlife listed under the *Nature Conservation (Wildlife) Regulation 2006*:
  - Endangered wildlife (fauna and flora)
  - Vulnerable wildlife (fauna and flora)
  - Special least concern animals.
- Regulated vegetation under the VM Act 1999 that is:
  - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems
  - Areas of essential habitat on the essential habitat map for wildlife prescribed as 'endangered wildlife' or 'vulnerable wildlife' under the Nature Conservation Act 1992
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse map
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map.
- Connectivity areas: areas of vegetation that are of sufficient size and configured in a way that maintains ecosystem functioning and will remain in the landscape despite threatening processes
- High preservation areas of wild river areas declared under the Wild Rivers Act 2005

- Wetlands in a wetland protection area or wetlands of high ecological significance shown on the Map of Referable Wetlands as defined in the Environmental Protection Regulation 2008, schedule 12
- Wetlands and watercourses in high ecological value waters as defined in the Environmental Protection (Water) Policy 2009, schedule 2.
- Legally secured offset areas
- Bushland habitat, high value rehabilitation habitat and medium value rehabilitation habitat as defined in South East Queensland Koala Conservation State Planning Regulatory Provisions, Schedule 4.

An assessment of the MSES within the Santos GFD Project tenures (or Terrestrial Ecology Study area) is shown in Table 3-2.

Table 3-2 MSES and their likely presence within the GFD Project tenures or Terrestrial Ecology Study area

MSES	Trigger	Likely presence with the GFD Project tenures or Terrestrial Ecology Study area
Protected areas	The following protected areas declared under the NC Act: • National park • National park (scientific) • National park (Aboriginal land) • National park (Torres Strait Islander land) • National park (Cape York Peninsular Aboriginal land) • National park (recovery) • Conservation parks • Resources reserve Nature refuges.	The following protected occur within the GFD Project tenures: • *Expedition National Park* – the largest National Park within the GFD Project area located in the Arcadia and Fairview gas fields. • *Humboldt National Park* – a large area of remnant vegetation (formerly State Forest) located in the Arcadia gas fields in ATP 804P. • *Lake Murphy Conservation Park* – situated in the Scotia gas fields in ATP 803P. Lake Murphy Conservation Park protects a large perched ephemeral freshwater wetland (ie RE 11.3.27) situated beneath the Murphy Range. • *Carraba Conservation Park* – situated in the Scotia gas fields in ATP 803P.
Marine parks	The following zones of Queensland marine parks (Great Barrier Reef Coast Marine Park, Moreton Bay Marine Park and Great Sandy Marine Park) declared under the MP Act 2004: • Marine national park • Buffer • Marine conservation park • Scientific research • Preservation.	No zones of Queensland marine parks (Great Barrier Reef Coast Marine Park, Moreton Bay Marine Park and Great Sandy Marine Park) declared under the MP Act occur within the GFD Project Area.
Fish habitats	The following areas and values declared or otherwise described under the *Fisheries Act* 1994: • Declared fish habitat areas • Marine plants • Fish passage.	There are no marine plants or Fish Habitat Areas or fish passages located within the GFD Project area. Aquatic ecosystems, including streams and rivers within the GFD Project area provide habitat and dispersal corridors for fish species. Twenty-three species from 15 families have been recorded in the Dawson River Catchment, out of a known 27 species from 18 families in the Fitzroy Basin. The construction of linear infrastructure for the GFD project will require the crossing of waterways. Any action that has a significant residual adverse impact on fish passage will require offsetting.

MSES	Trigger	Likely presence with the GFD Project tenures or Terrestrial Ecology Study area
The habitat for protected wildlife	Habitat for the following protected wildlife listed under the *Nature Conservation (Wildlife) Regulation 2006*: • Endangered wildlife (fauna and flora) • Vulnerable wildlife (fauna and flora) • Special least concern animals.	Based on database searches the following species under the *Nature Conservation (Wildlife) Regulation 2006* are known or are predicted to occur in the Terrestrial Ecology Study area: • 26 species listed as endangered • 43 species listed as vulnerable • 24 species listed as special least concern animals (21 migratory birds and 3 mammals) A full list of the protected wildlife listed under the *Nature Conservation (Wildlife) Regulation 2006* and their likelihood of occurrence is provided in Appendix B.
Regulated vegetation	Regulated vegetation under the VM Act that is: • Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems • Areas of essential habitat on the essential habitat map for wildlife prescribed as 'endangered wildlife' or 'vulnerable wildlife' under the Nature Conservation Act 1992 • Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse map. • Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map.	Using the more conservative biodiversity status on the Regional Ecosystem Description Database (REDD), there are approximately 78,674 ha of Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems. Of that 29,600 ha are mapped as endangered and 49,074 ha are mapped as Of Concern. Essential habitat for ten conservation significant flora species and eight conservation significant fauna species has been mapped in the GFD Project tenures. A list of the species and the relevant GFD Project tenures in which the essential habitat occurs is provided in Appendix C. There are approximately 315,610 hectares of remnant vegetation (Category B areas on the regulated vegetation management map) within the GFD Project tenures. Given the size and the extent of some vegetation patches and the many wetlands and watercourses present within the GFD Project tenures, it is expected that many regional ecosystems will intersect with wetlands and watercourses identified on the vegetation management wetlands map and the vegetation management watercourse map. These will occur in all tenures.

MSES	Trigger	Likely presence with the GFD Project tenures or Terrestrial Ecology Study area
Areas of connectivity	Areas of vegetation that are of sufficient size and configured in a way that maintains ecosystem functioning and will remain in the landscape despite threatening processes.	Connectivity is present from the Blackdown Tablelands to the north of ATP 804P, to the remnant vegetation of Expedition Range adjacent to ATP 745P. A continuous State significant region of native vegetation extends from near Injune in the south to the Blackwater Tableland in the north, for a distance of approximately 260 km. Although as narrow as 5 km near Arcadia Valley in the south, the majority of the range exceeds 25 km in width and is over 32 km wide to the east of ATP 804P. There is also extensive State significant vegetation associated with the Expedition, Palmgrove, Isla Gorge and Precipice National Parks system link to Carnarvon National Park in the west. This body of interconnected vegetation provides high quality habitat for flora and fauna species. The Dawson Highway acts as a minor barrier to movement in this corridor. More mobile species and those with larger home ranges are considered to benefit greatest from landscape wide connectivity. Connectivity across the landscape of the remaining GFD Project tenures is generally fragmented; however, functional connectivity is retained through local linkages of remnant and regrowth vegetation, associated with roadside and riparian corridors linking larger patches of vegetation on private land and State Forests. These linkages are likely to provide landscape permeability for mobile species such as birds and bats. Areas of connectivity occur throughout the GFD Project Area. It is likely the development of linear infrastructure in the GFD Project Area will have some impact on these areas of connectivity.
Wild river areas	High preservation areas of wild river areas declared under the *Wild Rivers Act 2005*	There are no high preservation areas of wild river areas declared under the *Wild Rivers Act 2005* within the GFD Project Area.
Wetlands	Wetlands in a wetland protection area or wetlands of high ecological significance shown on the Map of Referable Wetlands as defined in the *Environmental Protection Regulation 2008*, schedule 12.	Wetlands in a wetland protection area or wetlands of high ecological significance shown on the Map of Referable Wetlands occur throughout the Arcadia, Roma and Scotia gas fields. Locations shown on the Map of Referable Wetlands include: • Areas associated with the Dawson River in ATP 803P • Areas associated with Blyth Creek in PL 7 • Areas between Chinchinbilla Creek and Lagoon Creek in PL 6 • Three wetlands in the central and northern parts of ATP 613 associated with Kangaroo, Yuleba and Blackfellows Creeks.
Wetlands and watercourses	Wetlands and watercourses in high ecological value waters as defined in the *Environmental Protection (Water) Policy 2009*, Schedule 2.	The GFD Project area comprises the southern portion of the Fitzroy River Basin and the northern portion of the Condamine-Balone River Basin. There are six major sub-catchments and a number of wetlands. Wetlands and watercourses in high ecological value waters are likely to occur throughout the GFD Project area. It is likely the development of linear infrastructure in the GFD Project area will have some impact on these areas.

MSES	Trigger	Likely presence with the GFD Project tenures or Terrestrial Ecology Study area
Legally Secured Offset Areas	All Legally secured offset areas:	The legally secured offsets register provides information on vegetation management offsets that have been approved in accordance with the Vegetation Management Act 1999, which is administered by the DNRM This was received by Santos on 20 January 2014. It was last updated in June 2013. The Legally Secured Biodiversity Offsets Register provides information on offsets that has have been approved in accordance with the Queensland Biodiversity Offsets Policy, which is administered by EHP. This was received by Santos on 20 January 2014. It was last updated in November 2013 Within the GFD Project Area, no offsets approved in accordance with the VM Act and no Biodiversity Offsets approved in accordance with the Queensland Biodiversity Offsets were identified on the legally secured offset register search.
Koala Habitat	Bushland habitat, high value rehabilitation habitat and medium value rehabilitation habitat as defined in South East Queensland Koala Conservation State Planning Regulatory Provisions, Schedule 4.	The whole of the GFD Project Area is located within the Brigalow Belt Bioregion. There will be no residual significant impact to Koala habitat in the South East Queensland Bioregion as a result of the GFD Project. The Koala is an MNES as it is listed as a Vulnerable species under the EPBC Act. Offsets for impact to the Koala may be required (See Table 3-2).

4 Santos GLNG's existing environmental offsets projects

Santos GLNG currently has approval to develop 2,650 production wells and associated infrastructure within the gas fields of Roma, Fairview and Arcadia. The GLNG Environmental Offset Strategy and related Environmental Offset Plans for the CSG Fields, the gas transmission pipeline and the LNG plant were submitted to the Australian and Queensland Governments in April and May 2011. These plans are currently being implemented by Santos GLNG and include the identification of suitable land based values.

From the work done to date, an assessment was undertaken to determine whether there were any potential offsets areas surplus to the current GLNG project requirements that could be utilised for the GFD Project. The results of this assessment are provided in Table 4-1. The surplus offsets areas provided below are estimates and may be used in by the GFD Project only once they have been better assessed and verified in the field. Any surplus offsets area will only be used where relevant and following an assessment and acquittal process the staged offsets approach outlined in Section 5.

Table 4-1 Estimated potential surplus offsets areas available following 2010 offset provisions

Environmental Value / Approval Requirement	Potential offset areas surplus to GLNG Project needs (ha)
MNES Threatened ecological communities	
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	51
Brigalow (*Acacia harpophylla* dominant and co-dominant)	0
MNES - Threatened fauna habitat	
Dasyurus hallucatus (Northern Quoll)	2,938
Rostratula australis (Australian Painted Snipe)	0
Erythrotriorchis radiatus (Red Goshawk)	2,624
Turnix melanogaster (Black-breasted Button-quail)	51
Delma torquate (Collared Delma)	3,637
Furina dunmalli (Dunmall's Snake)	3,534
Chalinolobus dwyeri (Large-eared Pied Bat, Large Pied Bat)	2,874
Denisonia maculata (Ornamental Snake)	63
Nyctophilus timoriensis (Eastern Long-eared Bat)	1,536
Geophaps scripta scripta (Squatter Pigeon (Southern))	586
Egernia rugosa (Yakka Skink)	3,619
Paradelma orientalis (Brigalow Scaly-foot)	3,534
Matters of State environmental significance	
Endangered Regional Ecosystem 11.9.4	51
Endangered Regional Ecosystem 11.9.5	0
Endangered Regional Ecosystem 11.4.3	0
Other Of Concern and Endangered Regional Ecosystems (RE's 11.3.2, 11.3.17 and 11.9.7)	242

Environmental Value / Approval Requirement	Potential offset areas surplus to GLNG Project needs (ha)
Essential Habitat for *Apatophyllum tertifolium*	911
Essential Habitat for *Acacia calantha*	287

* The 151 ha is of mixed value. It is known that there is excess Brigalow included in the 151 ha but the extent of Brigalow and the other values within this property are yet to be fully determined.
1. Kentucky property described as Lot 1 on Plan WT37

As part of the GLNG 2010 approval there was additional offsets requirements for 10 protected plant species listed under the NC Act and the EPBC Act. These offset requirements were based on the number of individuals disturbed and not on the area of habitat disturbed for the relevant species. It is possible these offsets sites may also provide surplus areas for future offsetting, however, because the offset requirements were based on number of individuals the potential surplus areas have not been determined.

In addition to areas mentioned in Table 4-1, there are also another 151 (ha) of mixed value potential offset areas surplus to GLNG Project needs. It is known that there are areas of Brigalow included in the 151 ha but the extent of Brigalow and the other values within this property are yet to be fully determined.

5 Staged offsets approach

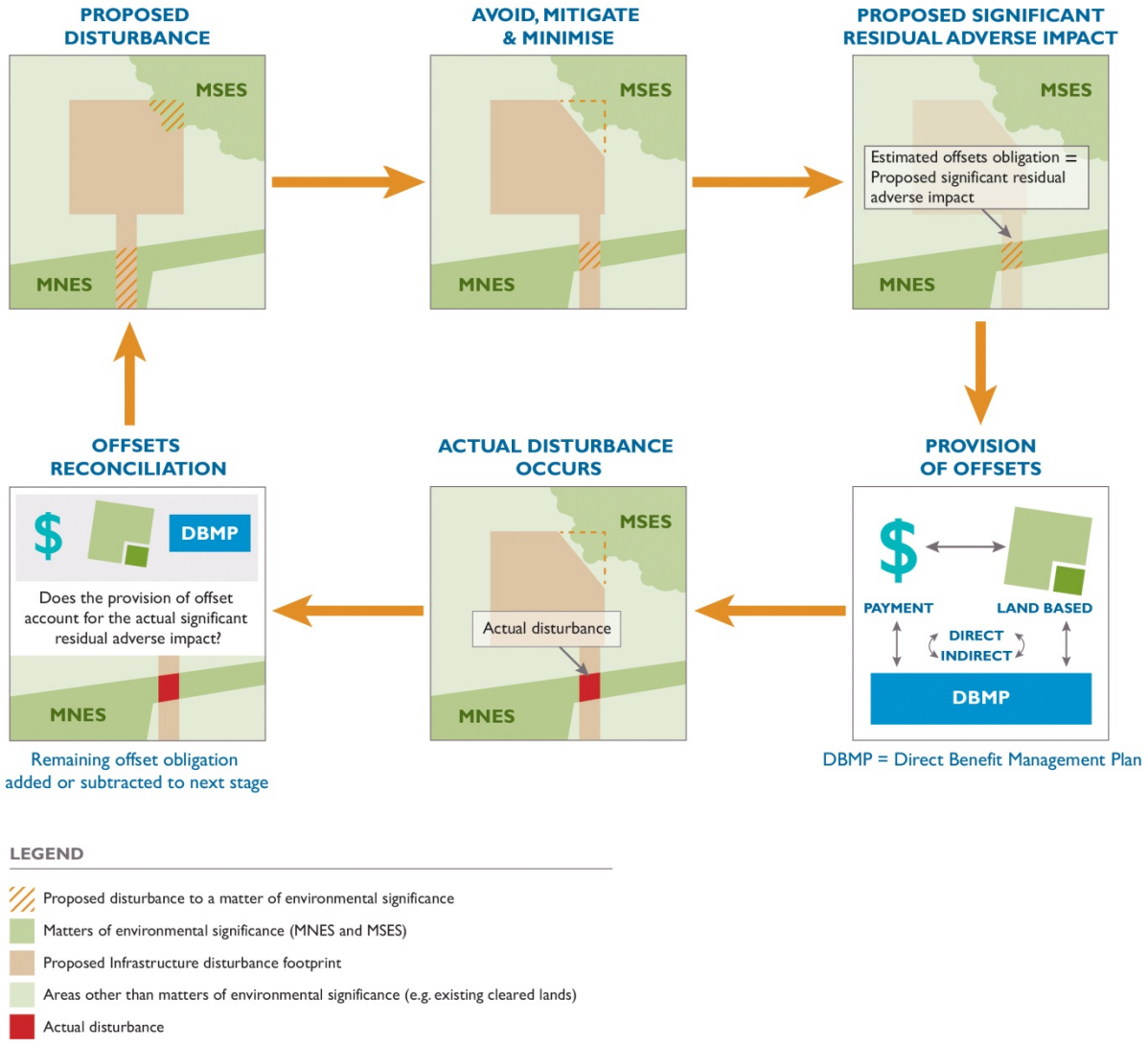
The GFD Project area will be progressively developed as the gas resource is realised. This adaptive management approach and the highly variable nature of gas field development means the full extent of impact is not known from stage to stage and a quantifiable significant residual adverse impact cannot accurately be formulated during the EIS stage. Once the significant residual adverse impacts are quantified a suitable offsets solution can be identified and secured.

Santos GLNG proposes to provide an offsets obligation in multiple stages to match the relevant disturbance for each stage. This staged offset strategy is promoted in the Queensland *Draft Environmental Offsets Policy* and is supported by Section 5.3 of the *EPBC Act Offsets Policy* which states: “In some cases, a suitable offset may not be proposed or available and a decision on the overall acceptability of the project will need to be made”.

Santos GLNG’s offset obligations will be managed by an Offsets Delivery Plan. Each stage of the offsets program will apply to a proposed development activity over a fixed period of time. For example the infrastructure for a particular stage may consist of 40 km of linear disturbance such as access tracks and pipelines and 30 well pads and the fixed length of time for this development may be four years. Using this development snapshot instead of a whole of GFD Project estimate allows the significance of residual adverse impacts on MNES and MSES for each stage of infrastructure development to be estimated with relative accuracy.

A high level schematic of Santos GLNG’s staged offsets approach, field development and the chronology of activities are shown in Figure 5-1

Figure 5-1 Santos GLNG's staged offsets approach to field development



5.1 Stage length

The offsets stage length will vary depending on the known work program and known gas resources. It is anticipated the length for each stage will be between three and five years and may, where relevant, coincide with the preparation and submission of the Plan of Operations for Resource Authorities as required under the EP Act. Each stage of offset will require an offsets plan.

5.2 Disturbance request, assessment and approval

Santos GLNG will adopt specific management principles when planning for and implementing new petroleum activities that may result in land disturbance. These management principles are applied using the following hierarchy:

1. Avoidance – Avoiding direct and indirect adverse environmental impacts where reasonable and practicably possible;
2. Minimise – Minimise direct and indirect adverse environmental impacts where impacts cannot be avoided;
3. Mitigate – Implement mitigation and management measures to minimise direct, indirect and cumulative adverse environmental impacts; and

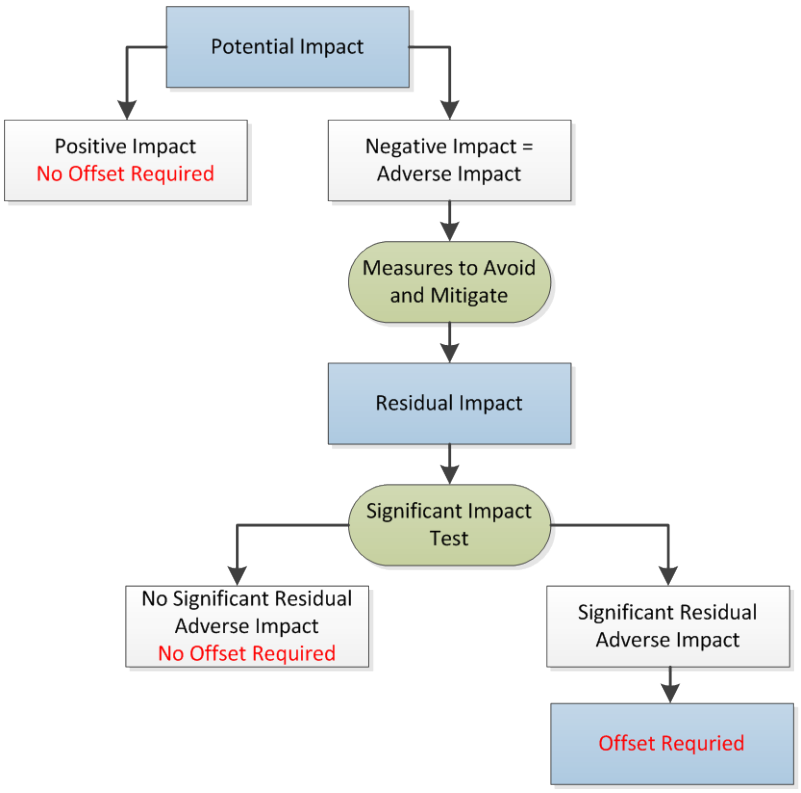
4. Remediation and Rehabilitation – Actively remediate and rehabilitate impacted areas to promote and maintain long-term recovery.
5. Offset – Where required, Santos GLNG will provide suitable offsets for unavoidable activities that result in a significant residual adverse impact to MNES and MSES in accordance with regulatory requirements. The offsets will be submitted for approval in accordance with both Queensland and Australian Government requirements.

5.3 Significant Residual Adverse Impacts

The Matters of National Environmental Significance Significant Impact Guidelines 1.1 define a 'significant impact' as '*an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts'*.

The EPBC Act Offsets Policy states: '*Offsets provide environmental benefits to counterbalance the impacts that remain after avoidance and mitigation measures. These remaining, unavoidable impacts are termed 'residual impacts'.* Offsets will be required to compensate for the residual adverse impacts on MNES and MSES as a result of the GFD Project. Santos GLNG will deliver offsets for residual impacts to MNES and MSES that are significant.

Figure 5-2 Determination of significant residual adverse impacts



The estimated offsets area will be calculated following the significant residual adverse impact assessment. This approach allows Santos GLNG to demonstrate avoidance, mitigation and management of impacts to MNES and MSES prior to the creation of an offsets obligation. The full details of the estimated offsets obligation, offsets delivery and recording and tracking offsets obligations will be provided in the environmental offsets plan.

5.4 Estimated offsets obligation

Once a preliminary work program for each stage is finalised a proposed land disturbance footprint can be created. The proposed land disturbance footprint will be assessed to determine if residual adverse impacts will occur and to create an estimated offsets obligation. This will be the estimated area of unavoidable adverse impacts to MNES and MSES that will occur as a result of proposed land disturbance footprint. The estimated offset obligation will inform the offset delivery.

5.5 Offsets delivery

The development of the GFD Project will require the delivery of a series of offset stages. Each offset stage will vary and will reflect the unavoidable adverse impacts to MNES and MSES estimated to accrue during that stage. Each offset package may comprise a combination of direct offsets and / or indirect offsets and other compensatory measures. Where direct offsets are used, offsets will preferentially align with conservation priorities for the impacted matter in order to deliver conservation gains for the matter impacted.

The offsets obligation for each stage will be delivered prior to the authorisation of any unavoidable adverse impact to MNES and MSES occurring.

5.6 Recording and tracking offset obligations

For all disturbances relating to MNES and MSES the following details will be recorded:

- The location and extent of the disturbance and the type of infrastructure or activity responsible for the disturbance
- The related pre-construction field scouting and ecological survey documents identifying the environmental constraint
- The reasons for the decision including justification for the action taken, description of the efforts taken to avoid impact, and an explanation why, given the coexisting constraints, the decision was justified
- The environmental constraints disturbed
- The extent of the disturbance and the relevant effect on the disturbance limits set out in the approval documents
- Actions and commitments to remediate or rehabilitate.

The information will be recorded and maintained so that it can be reported and audited. Disturbances will be frequently updated in the Santos GLNG GIS so that predicted disturbances can be analysed with actual disturbances and records updated to accurately reflect cumulative disturbances levels. Where an actual disturbance has been identified as having a significant residual adverse impact to a MNES or MSES and the disturbance will require offsetting it will become an offsets obligation.

5.7 Reconciliation and accounting offsets

At the end of each offsets stage an offset accounting and reconciliation process will be undertaken to ensure compliance with the proposed offset strategy. The assessment will be a GIS based task where the geographic extent of actual disturbance is assessed against the estimated offsets obligation.

Where a new offsets stage follows an existing offsets stage, an analysis can be undertaken to identify if the estimated offset obligation is in debit or credit relative to the actual extent of on-ground impact. Any difference, either debit or credit, will be carried over onto the following offsets stage or where no offset stage follows and a debit remains and offset must be provided to account for outstanding offset obligation.

Once the final stage of the GFD Project has been through the reconciliation and accounting process and there is no outstanding offset obligation, offsets for the GFD Project will be deemed to be finalised.

5.8 Environmental offsets delivery plan

For each offset stage of the GFD Project an environmental offsets delivery plan will be developed. The offsets plan for each stage will be developed and submitted for approval of DOTE and EHP at least three months prior to commencement. The environmental offsets delivery plan will:

- Report on the methodology and results of the environmental assessments completed over the proposed disturbance area (e.g. desktop and field ecological assessment results)
- Report on the measures to be taken to avoid, mitigate and manage impacts to MNES and MSES prior to assessing significant residual adverse impacts
- Identify and quantify estimated impacts to MNES and MSES for each stage. This will form the estimated offsets obligation for that stage
- Map of the proposed infrastructure and land disturbance activities in relation to areas identified as MNES and MSES
- Provide for a monitoring, reconciliation and accounting program to measure the success of mitigation and management measures and to account for impacts to MNES and MSES in consideration of approval disturbance limits
- Reconcile the estimated offsets obligation against the actual significant residual adverse impacts on MNES and MSES for each stage
- Provide mechanisms to deliver offsets for any significant residual adverse impacts that were in excess of the estimated offsets obligation.

Once all the offsets obligations have been met an Environmental Offsets Delivery Plan for a subsequent stage can be developed.

6 References

Australian Government (1999) *Environmental Protection and Biodiversity Conservation Act 1999*, Canberra.

Australian Government (2013), EPBC Protected Matters Search Report, Department of the Environment, Available: http://www.environment.gov.au/epbc/pmst/index.html. Accessed 14 November 2013

Commonwealth, Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (Department of Sustainability, Environment, Water, Population and Communities Public Affairs) 2012.

Queensland Government (1992). *Nature Conservation Act 1992*, Brisbane

Queensland Government (1994). *Environment Protection Act 1994*, Brisbane

Queensland Government (1999). *State Development and Public Works Organisation Regulation 1999*, Brisbane

Queensland Government (1999). *Vegetation Management Act 1999*, Brisbane

Queensland Government (2008), Queensland Government Environmental Offsets Policy, Environmental Protection Agency (EPA).

Queensland Government (2011), Policy for Vegetation Management Offsets, Department of Environment and Resource Management (DERM).

Queensland Government (2012), Marine Fish Habitat Offset Policy Version: FHMOP005.2 Department of Agriculture, Fisheries and Forestry (DAFF).

Queensland Government (2014), Queensland Biodiversity Offset Policy, Department of Environment and Heritage Protection (EHP) Ecosystem Outcomes 2014.

Queensland Government (2014), Environmental Offsets Bill 2014.

Queensland Government (2014) Department of Environment and Heritage Protection (EHP) Environmental Offsets Policy website available: https://www.ehp.qld.gov.au/management/environmental-offsets/offsets-bill.html#prescribed_environmental_matters Accessed 6 April 2014.

Appendix A Land disturbance probabilistic calculation model output

Receptor	Total coverage of ecological value in GFD Project tenures (GFD Project area = 1,067,575 ha)	GFD Project tenures development scenario Unmitigated potential disturbance area for 6,100 wells (ha)	Percentage (%) disturbance to receptors within the GFD Project tenures as a result of the development scenario
EPBC Act Threatened ecological communities			
TEC Brigalow	18,373	179	0.97%
TEC Coolabah	4,328	124	2.86%
TEC Grasslands QCH	17,832	284	1.59%
TEC Grasslands SQ	309	4	1.30%
TEC SEVT	9,189	190	2.07%
TEC Weeping Myall	24,069	517	2.15%
EPBC Act fauna habitat cumulative summary			
'Endangered' fauna total	376,546	7,072	1.87%
'Migratory' fauna total	882,922	17,299	1.96%
'Vulnerable' fauna total	484,568	7,415	1.53%
EPBC Act threatened and 'migratory' fauna species habitat			
Australian bittern habitat	7,485	168	2.24%
Australian painted snipe habitat	7,485	168	2.24%
Black-breasted button quail habitat	8,934	233	2.61%
Black-throated finch habitat	109,358	2,745	2.51%
Brush-tailed rock wallaby habitat	5,343	166	3.11%
Cattle egret habitat	458,147	8,162	1.78%
Collared delma habitat	181,252	2,703	1.49%
Dunmalls snake habitat	179,161	2,512	1.40%
Fitzroy River turtle habitat	2,929	73	2.51%
Five-clawed worm-skink habitat	6,203	40	0.64%
Glossy ibis habitat	7,485	168	2.24%
Great egret habitat	7,485	168	2.24%
Koala habitat	217,401	3,303	1.52%
Large-eared pied bat habitat	49,766	1,950	3.92%
Marine waders habitat	7,485	168	2.24%
Murray River cod habitat	2,929	73	2.51%
Northern quoll habitat	210,024	4855	2.26%
Ornamental snake habitat	19,644	279	1.42%
Osprey habitat	101,322	2,687	2.65%
Plains wanderer habitat	17,205	278	1.61%

Receptor	Total coverage of ecological value in GFD Project tenures (GFD Project area = 1,067,575 ha)	GFD Project tenures development scenario Unmitigated potential disturbance area for 6,100 wells (ha)	Percentage (%) disturbance to receptors within the GFD Project tenures as a result of the development scenario
Rainbow bee-eater habitat	790,479	15,738	1.99%
Red goshawk habitat	73,261	2,425	3.31%
South-eastern long-eared bat habitat	173,943	4,202	2.42%
Squatter pigeon habitat	221,515	4,032	1.82%
Star finch habitat	167,363	3,244	1.94%
Superb parrot habitat	67,934	2,136	3.14%
Swift parrot habitat	185,382	1,987	1.07%
White-bellied sea-eagle habitat	101,322	2,687	2.65%
Yakka skink habitat	129,174	4,144	3.21%
EPBC Act threatened flora species habitat			
Acacia curranii habitat	42,777	328	0.77%
Acacia grandifolia habitat	123,608	859	0.69%
Aristida annua habitat	5,152	40	0.77%
Arthraxon hispidus habitat	60,409	346	0.57%
Bertya opponens habitat	26,211	478	1.82%
Cadellia pentastylis habitat	9,189	232	2.53%
Calytrix gurulmundensis habitat	6,339	115	1.82%
Daviesia discolor habitat	1,013	7	0.70%
Dichanthium queenslandicum habitat	6,203	40	0.64%
Dichanthium setosum habitat	1,729	4	0.21%
Eriocaulon carsonii habitat	60,575	2,330	3.85%
Eucalyptus beaniana habitat	41,529	243	0.59%
Homopholis belsonii habitat	50,992	1,937	3.80%
Homoranthus decumbens habitat	173,665	1,051	0.61%
Macrozamia platyrhachis habitat	197,368	2,496	1.26%
Phaius australis habitat	72,912	481	0.66%
Swainsona murrayana habitat	5,152	40	0.77%
Thesium australe habitat	31,961	1,659	5.19%
Tylophora linearis habitat	140,986	975	0.69%
Westringia parvifolia habitat	36,858	263	0.71%
Xerothamnella herbacea habitat	7,725	129	1.67%

Appendix B Likelihood of occurrence assessment for conservation significant species

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Apocynaceae	*Cerbera dumicola*	-	NT	-	Known to occur
Arecaceae	*Livistona fulva*	Blackdown Tablelands palm	NT	-	Known to occur
Arecaceae	*Livistona nitida*	Carnarvon fan palm	NT	-	Known to occur
Asclepidaceae	*Tylophora linearis*	Thin-leaved tylophora	E	E	Moderate likelihood of occurrence
Asteraceae	*Cymbonotus maidenii*	Darling daisy	E	-	Known to occur
Asteraceae	*Picris barbarorum*	Plains picris	V	-	Known to occur
Asteraceae	*Rutidosis crispata*	-	V	-	Known to occur
Asteraceae	*Rutidosis glandulosa*	-	NT	-	Known to occur
Asteraceae	*Rutidosis lanata*	-	E	-	Known to occur
Byttneriaceae	*Commersonia pearnii*	-	E	-	Known to occur
Caesalpiniaceae	*Senna acclinis*	Rainforest cassia	NT	-	Known to occur
Campanulaceae	*Wahlenbergia islensis*	Cliff bluebell	NT	-	Known to occur
Celastraceae	*Apatophyllum teretifolium*	Sandstone prickle bush	NT	-	Known to occur
Cupressaceae	*Callitris baileyi*	Bailey's cypress	NT	-	Known to occur
Cyperaceae	*Cyperus clarus*	-	V	-	Known to occur
Cyperaceae	*Eleocharis blakeana*	-	NT	-	Known to occur
Ericaceae	*Leucopogon grandiflorus*	Large-flowered beard-heath	NT	-	Known to occur
Eriocaulaceae	*Eriocaulon carsonii*	Salt pipewort	E	E	Known to occur
Euphorbiaceae	*Bertya opponens*	-	C	V	Known to occur
Euphorbiaceae	*Bertya pedicellata*	-	NT	-	Known to occur
Fabaceae	*Daviesia discolor*	Bitter pea	V	V	Known to occur
Fabaceae	*Daviesia quoquoversus*	-	V	-	Known to occur
Fabaceae	*Desmodium macrocarpum*	Large-podded trefoil	NT	-	Known to occur
Fabaceae	*Swainsona murrayana*	Slender darling-pea	V	V	Moderate likelihood of occurrence
Fabaceae	*Zornia pallida*	-	NT	-	Known to occur
Haloragaceae	*Myriophyllum artesium*	Milfoil	E	-	Known to occur

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Lamiaceae	*Plectranthus blakei*	-	NT	-	Known to occur
Lamiaceae	*Westringia parvifolia*	-	V	V	Moderate likelihood of occurrence
Loganiaceae	*Logania diffusa*	-	V	V	Low likelihood of occurrence
Loranthaceae	*Lysiana filifolia*	-	NT	-	Known to occur
Mimosaceae	*Acacia argentina*	-	V	-	Known to occur
Mimosaceae	*Acacia barakulensis*	Waajie wattle	V	-	Known to occur
Mimosaceae	*Acacia calantha*	Cracow wattle	NT	-	Known to occur
Mimosaceae	*Acacia curranii*	Curly-bark wattle	V	V	Known to occur
Mimosaceae	*Acacia grandifolia*	-	C	V	Known to occur
Mimosaceae	*Acacia islana*	Isla Gorge wattle	V	-	Known to occur
Mimosaceae	*Acacia spania*	Western rosewood	NT	-	Known to occur
Mimosaceae	*Acacia storyi*	-	NT	-	Known to occur
Mimosaceae	*Acacia tenuinervis*	-	NT	-	Known to occur
Mimosaceae	*Acacia wardellii*	Thomby Range wattle	V	-	Known to occur
Myrtaceae	*Calytrix gurulmundensis*	-	V	V	Known to occur
Myrtaceae	*Calytrix islensis*	-	V	-	Known to occur
Myrtaceae	*Eucalyptus beaniana*	Bean's ironbark	V	V	Known to occur
Myrtaceae	*Eucalyptus curtisii*	Plunket mallee	NT	-	Known to occur
Myrtaceae	*Eucalyptus pachycalyx* subsp. *waajensis*	Pumpkin gum	E	-	Known to occur
Myrtaceae	*Eucalyptus sideroxylon subsp. improcera*	-	V	-	Known to occur
Myrtaceae	*Homoranthus decasetus*	-	NT	-	Known to occur
Myrtaceae	*Homoranthus decumbens*	A shrub	V	E	Known to occur
Myrtaceae	*Melaleuca groveana*	Grove's paper-bark	NT	-	Known to occur
Myrtaceae	*Melaleuca irbyana*	Swamp tea-tree	E	-	Known to occur
Myrtaceae	*Melaleuca pearsonii*	-	NT	-	Known to occur
Myrtaceae	*Micromyrtus carinata*	Gurulmundi heath-myrtle	E	-	Known to occur
Myrtaceae	*Micromyrtus patula*	-	E	-	Known to occur
Myrtaceae	*Ochrosperma obovatum*	-	V	-	Known to occur

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Myrtaceae	*Sannantha brachypoda*	-	NT	-	Known to occur
Oleaceae	*Notelaea pungens*	-	NT	-	Known to occur
Orchidaceae	*Chiloglottis longiclavata*	Northern wasp orchid	NT	-	Known to occur
Orchidaceae	*Phaius australis*	Swamp orchid	E	E	Known to occur
Orchidaceae	*Pterostylis cobarensis*	Cobar greenhood orchid	C	V	Moderate likelihood of occurrence
Picrodendraceae	*Pseudanthus pauciflorus*	-	NT	-	Known to occur
Poaceae	*Amphibromus whitei*	-	EX	EX	Known to occur
Poaceae	*Aristida annua*	-	V	V	Known to occur
Poaceae	*Arthraxon hispidus*	Hairy-joint grass	V	V	Known to occur
Poaceae	*Dichanthium queenslandicum*	King bluegrass	V	E	Known to occur
Poaceae	*Dichanthium setosum*	Blue grass	NT	V	Known to occur
Poaceae	*Homopholis belsonii*	Belson's panic	E	V	Known to occur
Poaceae	*Sporobolus partimpatens*	-	NT	-	Known to occur
Proteaceae	*Hakea fraseri*	Fraser's hakea	C	V	Known to occur
Rhamnaceae	*Cryptandra ciliata*	Silky Cryptandra	NT	-	Known to occur
Santalaceae	*Thesium australe*	Toad flax	V	V	Known to occur
Solanaceae	*Solanum dissectum*	-	E	-	Known to occur
Solanaceae	*Solanum elachophyllum*	-	E	-	Known to occur
Solanaceae	*Solanum papaverifolium*	-	E	-	Known to occur
Solanaceae	*Solanum stenopterum*	-	V	-	Known to occur
Surianaceae	*Cadellia pentastylis*	Ooline	V	V	Known to occur
Thelypteridaceae	*Thelypteris confluens*	Swamp fern	V	-	Known to occur
Zamiaceae	*Macrozamia platyrhachis*	Cycad	E	E	Known to occur
Amphibians	Cooloola tree frog	*Litoria cooloolensis*	NT	-	Low likelihood of occurrence
Amphibians	Rough frog	*Cyclorana verrucosa*	NT	-	Known to occur
Arthropods	Pale imperial hairstreak butterfly	*Jalmenus eubulus*	V	-	Known to occur
Aves	Australasian bittern	*Botaurus poiciloptilus*	C	E	Moderate likelihood of occurrence
Aves	Black-breasted button-quail	*Turnix melanogaster*	V	V	Moderate likelihood of occurrence

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Aves	Black-chinned honeyeater	*Melithreptus gularis*	NT	-	Known to occur
Aves	Black-necked stork	*Ephippiorhynchus asiaticus*	NT	-	Known to occur
Aves	Black-throated finch	*Poephila cincta cincta*	E	E	Moderate likelihood of occurrence
Aves	Cotton pygmy-goose	*Nettapus coromandelianus*	NT	-	Known to occur
Aves	Freckled duck	*Stictonetta naevosa*	NT	-	Known to occur
Aves	Glossy black-cockatoo	*Calyptorhynchus lathami*	V	-	Known to occur
Aves	Grey goshawk	*Accipiter novaehollandiae*	NT	-	Known to occur
Aves	Major mitchell's cockatoo	*Lophochroa leadbeateri*	V	-	Known to occur
Aves	Painted honeyeater	*Grantiella picta*	V	-	Known to occur
Aves	Paradise parrot	*Psephotus pulcherrimus*	EX	PE	Low likelihood of occurrence
Aves	Plains-wanderer	*Pedionomus torquatus*	V	V	Moderate likelihood of occurrence
Aves	Powerful owl	*Ninox strenua*	V	-	Known to occur
Aves	Red goshawk	*Erythrotriorchis radiatus*	E	V	Moderate likelihood of occurrence
Aves	Square-tailed kite	*Lophoictinia isura*	NT	-	Known to occur
Aves	Squatter pigeon	*Geophaps scripta scripta*	V	V	Known to occur
Aves	Star finch	*Neochmia ruficauda ruficauda*	E	E	Moderate likelihood of occurrence
Aves	Superb parrot	*Polytelis swainsonii*	C	V	Moderate likelihood of occurrence
Aves	Swift parrot	*Lathamus discolor*	E	E	Moderate likelihood of occurrence
Aves	Turquoise Parrot	*Neophema pulchella*	NT	-	Known to occur
Fish	Murray cod	*Maccullochella peelii*	C	V	Moderate likelihood of occurrence
Mammals	Bridled nail-tail wallaby	*Onychogalea fraenata*	E	E	Known to occur
Mammals	Brush-tailed rock-wallaby	*Petrogale penicillata*	V	V	Known to occur
Mammals	Grey-headed flying-fox	*Pteropus poliocephalus*	C	V	Known to occur
Mammals	Koala	*Phascolarctos cinereus*	S	V	Known to occur
Mammals	Large pied bat	*Chalinolobus dwyeri*	V	V	Known to occur
Mammals	Little pied bat	*Chalinolobus picatus*	NT	-	Known to occur
Mammals	Northern quoll	*Dasyurus hallucatus*	C	E	Moderate likelihood of occurrence
Mammals	South-eastern long-eared bat	*Nyctophilus corbeni*	C	V	Known to occur

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Reptiles	Brigalow scaly-foot	*Paradelma orientalis*	V	-	Known to occur
Reptiles	Collared delma	*Delma torquata*	V	V	Known to occur
Reptiles	Collett's Snake	*Pseudechis colletti*	NT	-	Moderate likelihood of occurrence
Reptiles	Common death adder	*Acanthophis antarcticus*	NT	-	Known to occur
Reptiles	Darling Downs earless dragon	*Tympanocryptis tetraporophora*	E	-	Known to occur
Reptiles	Dunmall's snake	*Furina dunmalli*	V	V	Known to occur
Reptiles	Eyrean Earless Dragon	*Tympanocryptis tetraporophora*	E	-	Moderate likelihood of occurrence
Reptiles	Fitzroy river turtle	*Rheodytes leukops*	V	V	Known to occur
Reptiles	Five-clawed worm-skink	*Anomalopus mackayi*	E	V	Moderate likelihood of occurrence
Reptiles	Golden-tailed gecko	*Strophurus taenicauda*	NT	-	Known to occur
Reptiles	Grey snake	*Hemiaspis damelii*	E	-	Known to occur
Reptiles	Ornamental snake	*Denisonia maculata*	V	V	Known to occur
Reptiles	Woma	*Aspidites ramsayi*	NT	-	Known to occur
Reptiles	Yakka skink	*Egernia rugosa*	V	V	Known to occur
Aves	Australian painted snipe	*Rostratula australis*	V, S	E, M (C)	Known to occur
Aves	Black-faced monarch	*Monarcha melanopsis*	S	M (B)	Known to occur
Aves	Black-tailed godwit	*Limosa limosa*	S	M (B,J,C,R)	Moderate likelihood of occurrence
Aves	Caspian tern	*Hydroprogne caspia*	S	M (C)	Known to occur
Aves	Cattle egret	*Ardea ibis*	S	M (J,C)	Known to occur
Aves	Common greenshank	*Tringa nebularia*	S	M (B,J,C,R)	Known to occur
Aves	Curlew sandpiper	*Calidris ferruginea*	S	M (B,J,C,R)	Moderate likelihood of occurrence
Aves	Eastern great egret	*Ardea modesta*	S	M (J,C)	Known to occur
Aves	Fork-tailed swift	*Apus pacificus*	S	M (J,C,R)	Known to occur
Aves	Glossy ibis	*Plegadis falcinellus*	S	M (C)	Known to occur
Aves	Latham's snipe	*Gallinago hardwickii*	S	M (J,C,R)	Known to occur
Aves	Marsh sandpiper	*Tringa stagnatilis*	S	M (J,C,R)	Known to occur
Aves	Osprey	*Pandion haliaetus*	S	M (B)	Moderate likelihood of occurrence
Aves	Pacific golden plover	*Pluvialis fulva*	S	M (B,J,C,R)	Known to occur

Family	Scientific Name	Common Name	NC Act	EPBC Act	Likelihood of occurrence^
Aves	Rainbow bee-eater	*Merops ornatus*	S	M (J)	Known to occur
Aves	Rufous fantail	*Rhipidura rufifrons*	S	M (B)	Known to occur
Aves	Satin flycatcher	*Myiagra cyanoleuca*	S	M (B)	Known to occur
Aves	Sharp-tailed sandpiper	*Calidris acuminata*	S	M (J,C,R)	Known to occur
Aves	Spectacled monarch	*Monarcha trivirgatus*	S	M (B)	Known to occur
Aves	White-bellied sea-eagle	*Haliaeetus leucogaster*	S	M (C)	Known to occur
Aves	White-tailed tropicbird	*Phaethon lepturus*	S	M (J,C)	Low likelihood of occurrence
Aves	White-throated needle-tail	*Hirundapus caudacutus*	S	M (J,C)	Known to occur
Aves	Wood sandpiper	*Tringa glareola*	S	M (J,C,R)	Known to occur

- = Species not listed S = Special Least Concern E = Endangered M = Migratory V = Vulnerable NT = Near Threatened

(B) = A list of migratory species established under section 209 if the EPBC Act, these species are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)

COMMITTEE = Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA)

(J) = Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment (JAMBA)

COMMITTEE = Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA)

NC Act = Nature Conservation Act 1992 (Qld)

EPBC Act = Environment Protection and Biodiversity Conservation Act 1999 (Cth)

^ = Likelihood of occurrence within the GFD Project area and habitat descriptions are provided in Appendix R and U2.

Appendix C Essential habitat within the GFD Project tenures

Gas field	GFD Project tenure	Scientific name	Common name	NC Act status	EPBC Act status
Flora Species					
Arcadia	PL 233	*Eucalyptus beaniana*	Bean's ironbark	V	V
	PL 234	*Xerothamnella herbacea*	Xerothamnella	E	E
	PL 235	*Calytrix islensis*	-	V	-
Fairview	PL 90	*Acacia islana*	Isla Gorge wattle	V	-
		Xerothamnella herbacea	Xerothamnella	E	E
	PL 91	*Melaleuca irbyana*	Swamp tea-tree	E	-
	PL 92	*Melaleuca irbyana*	Swamp tea-tree	E	-
	PL 99	*Eriocaulon carsonii* subsp. *orientale*	Salt pipewort	E	E
	PL 100	*Acacia islana*	Isla Gorge wattle	V	-
Roma	PL 315	*Homopholis belsonii*	Belson's panic	E	V
		Picris barbarorum	Plains picris	V	-
	ATP 708P	*Solanum papaverifolium*	-	E	-
Scotia	ATP 803P	*Cadellia pentastylis*	Ooline	V	V
Fauna Species					
Arcadia	PL 233	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
	PL 234	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
	PL 235	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
Roma	PL 3	*Egernia rugosa*	Yakka skink	V	V
	PL 6	*Grantiella picta*	Painted honeyeater	V	-
	PL 8	*Paradelma orientalis*	Brigalow scaly-foot	V	-
	PL 310	*Paradelma orientalis*	Brigalow scaly-foot	V	-
Scotia	ATP 803P	*Jalmenus eubulus*	Imperial hairstreak (northern subspecies)	V	-
		Nyctophilus corbeni	Greater long-eared bat	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-